REMARKS

In response to the Patent Office Action mailed October 1, 2004, claims 1 to 16 have been cancelled and new claims 17 to 29 have been substituted for the rejected claims. Claims 1 to 16 were rejected on three grounds, namely, (1) claims 1 to 16 were rejected as anticipated by U.S. Patent No. 6,249,927 of ***Ando*** (the '927 Ando patent) under 35 U.S.C. § 102(b), (2) claims 1 and 3 to 16 were rejected as anticipated by U.S. Patent No. 5,035,021 of ***Le Devehat*** (the Le Devehat patent), and (3) claims 1 to 5 and 10 to 15 were rejected as anticipated by U.S. Patent No. 4,653,134 of ***Ando*** (the '134 Ando patent) under 35 U.S.C. § 102(b). Although the Applicant respectfully traverses such rejections of the claims, claims 1 to 16 have been cancelled and new claims 17 to 29 have been substituted for the rejected claims.

This application discloses a pig scraper for cleaning an internal surface of a conduit ***conveying coating***, such as paint used by the automotive industry. A conventional paint application apparatus typically includes a color changer and a rotary atomizer interconnected by a flexible conduit or tube wherein the paint may be pushed through the conduit by the pig scraper or pigging element with each application of a paint to a vehicle body, wherein the flexible conduit may have a length of more than 15 meters and wherein the pig scraper must be pushed through the conduit in two to three seconds or less. In a preferred embodiment, the pig scraper includes a body portion and at least one or preferably two sealing lips which engage the internal surface of the conduit to remove residual paint from the last application and solvent. Further, where the applicator is an electrostatic rotary atomizer at a high voltage and the source of paint is at ground potential, the delivery line must be clear of paint and solvent before painting. As set forth in the specification of this application, the conduit may include two pig scrapers which engage each other during the application of paint, such as where solvent is received between the pig scrapers and the pig scrapers are then driven

through the conduit from a source of paint under pressure to the applicator first purging the conduit and the applicator and then delivering paint to the applicator. Because of the required rapid delivery of paint through the conduit and the engagement of the pig scrapers in the conduit, the sealing lip is subject to damage, requiring replacement. As will be understood, such pig scrapers are relatively expensive and replacement requires shutting down the paint application.

The pig scraper of this invention solves these problems by (1) providing a sealing lip (18) on the body (14) having a diameter (32) less than the internal diameter of the conduit (36) including an annular sealing edge or rib (40) adjacent a free end (38) of the sealing lip which is generally triangular in cross-section including a first face (44) adjacent the free end (38), a second face (46) and an apex which engages and scrapes the internal surface of the conduit (12), and (2) providing a body portion having cylindrical end portions (24) and (28) preferably including flat ends (20) and (22). The triangular sealing edge or ribs (46) are ***"self-sharpening"*** as the pig scraper traverses back and forth through the conduit and reduce the likelihood of damage to the sealing lips including folding over of the sealing lips during the rapid transit of the pig scraper through the conduit. The projecting cylindrical end portions (24 and 28) permit engagement of the scraping pigs under pressure without damage to the scraping pigs or the sealing lips.

As set forth in the specification of this application, the first face (44) of the annular sealing edge (40) preferably defines an acute angle to the internal surface of the conduit of between 25 and 60 degrees, more preferably about 45 degrees and the second face (46) preferably defines an acute angle relative to the internal surface of the conduit (12) of between 10 and 60 degrees, or more preferably about 45 degrees. Further, the sealing lips (18) and (48) preferably have an axial length which is greater than 15% of the diameter (36) of the internal surface of the conduit.

The Applicant respectfully submits that none of the references cited by the Examiner disclose the features of the pig scraper of this invention now specifically recited in the claims as set forth hereinbelow.

The Ando '134 and Ando '927 patents disclose a duct cleaning device for cleaning flow lines through which slurry or powdered foodstuffs are conveyed, such as "thick malt syrup, ice cream, etc., or powdering raw materials such as flour are transferred from a storage tank to a site or to processing equipment" (Ando '134 patent) or "ice cream, mayonnaise or powdery material" (Ando '927 patent). Both of these patents disclose cleaning devices having opposed ends "with spherical guiding bodies" (5 in the Ando '134 patent and 1 in the Ando '927 patent). The cleaning device disclosed in the Ando '134 patent is made of an elastic material, such as synthetic rubber, having one (Figure 4) or a plurality (Figure 5) of recessed areas 3 which deform the body portion 1 radially to wipe off and remove residual material adhering to the inside surface of the pipe. It should be noted that where the cleaning device includes two recesses 3 as shown in Figure 5, both recesses face in the same direction for uniaxial movement of the cleaning device as shown in Figure 5 by the arrow. The Ando '927 patent discloses a similar cleaning device; however, the spherical guiding bodies 1 are interconnected by a dumbbell-shaped connector 3 such that the cleaning device will traverse an elbow as shown in Figure 3 and the body portion flares radially outwardly forming annular donut-shaped recesses 7 in opposed directions. Again, however, the duct-cleaning unit disclosed in the Ando '927 patent appears to be unidirectional. Thus, the cleaning devices disclosed in the Ando '134 patent and the Ando '927 patent are propelled through the pipe by pneumatic or hydraulic (water) pressure to clean viscous liquid or powder material from the inner surface of the pipe and would be entirely unsuitable for simultaneously conveying coating or paint or solvent through a conduit and removing coating or solvent from the conduit which is the primary function of the pig scraper of this invention.

Obviously, the duct cleaning devices disclosed in the Ando '134 patent and the Ando '927 patent would not be suitable for conveying paint or solvent and removing residual paint or solvent from a conduit, particularly a conduit having two pig scrapers which contact each other during the paint cycle. The spherical body portions would be unsuitable for this application. Further, the flaring body portions would quickly wear under the extreme conditions required for conveying a coating where the pig scraper must traverse a flexible conduit of 15 m or greater and return in a second or two as required by the pig scraper of this invention. Finally, it would not be obvious to use a sensor element in a cleaning device as disclosed in the Ando patents.

The '021 patent of Le Devchat does disclose a bidirectional scraper for pipes "for distributing oil, petroleum products, foodstuff products or paint." (Col. 1, lines 5 to 8). Further, the '021 patent is specifically concerned with wear of the scraper unit and proposes to solve this problem by providing replaceable elements of the scraper, including annular replaceable wear segments 2 and 3 removably mounted on an elongated body 4 wherein the body is formed of two complimentary parts 5 and 6 fixed to each other by a nut 7 trapped in one of the parts 5 and a bolt 8 is inserted into the other part 6. The Le Devehat patent discloses several embodiments of the wear elements, including the embodiment shown in Figure 7, wherein the wear segments 2B and 3B include cylindrical slots 30 and 31 discharging axially toward each other so as to form cylindrical scraping lips bordered by chamfers. An object of the scraper units disclosed in the Le Devehat patent is to enable "re-use of non-worn parts of the scrapers" (Col. 1, lines 35 to 37). Thus, the Le Devehat patent recognizes one of the problems solved by the pig scraper of this invention, but it solves this problem in an ***entirely different way***. That is, the Le Devehat patent proposes to solve the problems associated with pig scrapers by removing and replacing the wear segments when worn. It should be noted, however, that the Le Devehat patent is not directed to pig scrapers

for use in paint applicators, wherein the paint line must be shut down in the event of wear of the wear segments and the scraper disclosed in the Le Devehat patent would not be suitable for this application. The Applicant also respectfully submits that it would not be obvious to combine the features of the duct-cleaning units disclosed in the Ando '134 or the Ando '927 patent with the disclosure of the Le Devehat patent because the duct-cleaning units disclosed in the Ando patents are for an entirely different purpose than the scraper disclosed in the Le Devehat patent.

The pig scraper for cleaning an internal surface of a conduit conveying a coating as defined in new claim 17 includes a body portion and "at least one resilient sealing lip" extending from and spaced from the body portion including an outer surface "spaced from said internal surface of said conduit having an annular sealing edge ***generally triangular in cross-section*** having first and second faces extending at an acute angle to said internal surface" of the conduit and "an apex resiliently biased against" the internal surface of the conduit. As set forth above, the triangular shape of the sealing edge is self-sharpening as the pig scraper is traversed back and forth through the conduit maintaining a relatively sharp scraping edge and this feature of the pig scraper is not disclosed or suggested in the prior art. Therefore, the Applicant respectfully submits that Claim 17 is patentable over the prior art cited by the Examiner.

Claims 18 to 21, which are ultimately dependent upon Claim 17, define the preferred angles of the first and second faces of the sealing edge as disclosed in the specification of this application, wherein the first face adjacent the end of the sealing lip is preferably between 25 and 60 degrees, more preferably about 45 degrees, and the second face is between 10 and 60 degrees, more preferably about 30 degrees. In view of the fact that none of the prior art references disclose a triangular sealing edge, the Applicant respectfully submits that Claims 18 to 21also patentably defines over the prior art.

Claim 23, which is dependent upon Claim 17, more specifically recites the preferred configuration of the end portions of the pig scraper, wherein the end portion is cylindrical having a flat end face. Claim 24 further defines the axial length of the sealing lip as greater than 15% of the diameter of the internal surface of the conduit which is also not disclosed in the prior art, wherein the sealing lip disclosed in the Ando patents is about 10% of the internal diameter of the pipe.

Independent Claim 25 defines a pig scraper of this invention including an integral body portion having a longitudinal axis and "opposed cylindrical end portions" which, as set forth above, is not disclosed in the prior art. Claim 25 further defines sealing lips integral with the body portion and spaced from the body portion extending toward one of the end portions "surrounding said cylindrical end portions" spaced from the end portions including an outer surface spaced from the internal surface of the conduit having an edge resiliently biased against the internal surface of the conduit. As set forth above, none of the prior art references cited by the Examiner include a body portion having cylindrical end portions and it would not be obvious to combine the Ando patents with the disclosure of the Le Devehat patent to include the skirt portions or annular sealing lip disclosed in the Ando patents because, as set forth above, the scraper disclosed in the Le Devehat patent is for an entirely different purpose than the duct-cleaning units disclosed in the Ando patents. The Applicant therefore respectfully submits that Claim 25 also patentably distinguishes over the prior art including the references cited by the Examiner. Claim 27 more specifically recites that the annular edge is triangular and Claim 28, which is dependent upon Claim 27, recites that the first and second faces of the triangular edge are planar. Finally, Claim 29, which is dependent upon Claim 25, recites that the outer surface of the sealing lips are cylindrical and extend parallel to the internal surface of the conduit, which is also contrary to the teaching of the prior art references.

For the reasons set forth above, the Applicant respectfully submits that the new claims in this application patentably distinguish over the prior art and allowance of new Claims 17 to 29 is respectfully requested.

Although it is believed that no fee is due for the filing of this Amendment, the Commissioner is authorized to charge our Deposit Account No. 08-2789 for any additional fees or credit the account for any overpayments regarding this Amendment.

Respectfully submitted,

HOWARD & HOWARD ATTORNEYS

Raymond E. Scott

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Date

Raymond E. Scott, Reg. No. 22,981
Howard and Howard Attorneys, P.C.
The Pinehurst Office Center, Suite 101
39400 Woodward Ave.
Bloomfield Hills, MI 48304-5151
(248) 723-0306

CERTIFICATE OF FACSIMILE TRANSMISSION

I hereby certify that the attached **Amendment** is being facsimile transmitted to Examiner Shay L. Balsis, United States Patent and Trademark Office, at facsimile number (703) 872-9306 on December 16, 2004.

Tracy Smith

Tracy L. Smith

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